Amendments to the Claims

1. – 14 (cancelled)

15. (new): In a linear mimimum mean-square error receiver, a method of providing optimal linear estimates of a plurality of symbol substreams comprising:

computing a first observation vector, $R_{0,l}$, by correlating a set of delayed versions of a received signal with a long spreading code and a first walsh code;

computing a second observation vector, $R_{1,l}$, by correlating the set of delayed versions of the received signal with the long spreading code and a second walsh code;

computing a first inner product of a vertical concatenation of the first and second observation vectors with a first receiver vector to produce a first symbol estimate; and

computing a second inner product of the vertical concatenation of the first and second observation vectors with a second receiver vector to produce a second symbol estimate.

16. (new): The method of claim 15 wherein computation of the first receiver vector comprises:

computing a correlation matrix Γ_Q defined by $\mathbf{\Gamma_Q} = E\left\{\begin{bmatrix} \mathbf{R}_0\mathbf{R}_0^H & \mathbf{R}_0\mathbf{R}_1^T \\ \mathbf{R}_1^*\mathbf{R}_0^H & \mathbf{R}_1^*\mathbf{R}_1^T \end{bmatrix}\right\}$; and

computing a product of an inverse of the correlation matrix and a vertical concatenation of two channel vectors, f_0 and f_1^*, to yield

$$\mathbf{v}_{MMSE\_s_0} = \frac{\mathbf{\Gamma}^{-1}}{NI_{or}} \propto \begin{bmatrix} \mathbf{\Omega}^{-1} & 0 \\ 0 & (\mathbf{\Omega}^{-1})^* \end{bmatrix} \begin{bmatrix} \mathbf{f}_0 \\ \mathbf{f}_1^* \end{bmatrix}.$$

17. (new): The method of claim 15 wherein computation of the second receiver vector comprises:

computing a correlation matrix, Γ_Q, defined by $\mathbf{\Gamma}_{\mathbf{Q}} = E\left\{\begin{bmatrix} \mathbf{R}_0\mathbf{R}_0^H & \mathbf{R}_0\mathbf{R}_1^T \\ \mathbf{R}_1^*\mathbf{R}_0^H & \mathbf{R}_1^*\mathbf{R}_1^T \end{bmatrix}\right\}$;

and

computing a product of an inverse of the correlation matrix and a vertical concatenation of two channel vectors f_1 and $-f_0^*$ to yield

$$\mathbf{v}_{MMSE\_s_0} = \frac{\mathbf{\Gamma}^{-1}}{N I_{or}} \propto \begin{bmatrix} \mathbf{\Omega}^{-1} & 0 \\ 0 & \left(\mathbf{\Omega}^{-1}\right)^* \end{bmatrix} \begin{bmatrix} \mathbf{f}_1 \\ -\mathbf{f}_0^* \end{bmatrix}.$$

18. (new): The method of claim 15 wherein the first observation vector is defined by

$R_{0,l} = \sum_{i=1}^{N} r_{i+l}\, c_i^* w_i$, wherein c is the long spreading code, w is the walsh code, r is the received signal, N is a number of chips per walsh code and l is an index within the first observation vector.

19. (new): The method of claim 15 wherein the second observation vector is defined by

$R_{1,l} = \sum_{i=1}^{N} r_{N+i+l}\, c_{N+i}^* w_i$, wherein c is the long spreading code, w is the walsh code, r is the received signal, N is a number of chips per walsh code and l is an index within the second observation vector.

20. (new): The method of claim 15 wherein the first observation vector is defined by

$R_{0,l} = \sum_{i=1}^{2N} r_{i+l}\, c_i^{*} w_i^{0} = \sum_{i=1}^{N} r_{i+l}\, c_i^{*} w_i - \sum_{i=1}^{N} r_{N+i+l} c_{N+i}^{*}\, w_i$, wherein c is the long spreading code, w^0 is a first extended walsh code, w is the walsh code, r is the received signal, N is a number of chips per walsh code and l is an index within the first observation vector.

21. (new): The method of claim 15 wherein the second observation vector is defined by $R_{1,l} = \sum_{i=1}^{2N} r_{i+l}\, c_i^{*} w_i^{1} = \sum_{i=1}^{N} r_{i+l}\, c_i^{*} w_i + \sum_{i=1}^{N} r_{N+i+l}\, c_{N+i}^{*} w_i$, wherein c is the long spreading code, w^1 is a second extended walsh code, w is the walsh code, r is the received signal, N is a number of chips per walsh code and l is an index within the second observation vector.

22. (new): In a linear mimimum mean-square error receiver, a method of providing optimal linear estimates of a plurality of symbol substreams comprising:

filtering a received signal with a time reverse of an upper component, $\mathbf{\Omega}^{-1}\mathbf{f}_0$, of a receiver vector, $\mathbf{v}_{MMSE\_s_0} = \frac{\mathbf{\Gamma}^{-1}}{N I_{or}} \propto \begin{bmatrix} \mathbf{\Omega}^{-1} & 0 \\ 0 & (\mathbf{\Omega}^{-1})^{*} \end{bmatrix} \begin{bmatrix} \mathbf{f}_0 \\ \mathbf{f}_1^{*} \end{bmatrix} = \begin{bmatrix} \mathbf{\Omega}^{-1}\mathbf{f}_0 \\ (\mathbf{\Omega}^{-1})^{*}\mathbf{f}_1^{*} \end{bmatrix}$ to yield a first output;

filtering the received signal with a time reverse of a lower component, $(\mathbf{\Omega}^{-1})^{*}\mathbf{f}_1^{*}$, of the receiver vector, $\mathbf{v}_{MMSE\_s_0} = \frac{\mathbf{\Gamma}^{-1}}{N I_{or}} \propto \begin{bmatrix} \mathbf{\Omega}^{-1} & 0 \\ 0 & (\mathbf{\Omega}^{-1})^{*} \end{bmatrix} \begin{bmatrix} \mathbf{f}_0 \\ \mathbf{f}_1^{*} \end{bmatrix} = \begin{bmatrix} \mathbf{\Omega}^{-1}\mathbf{f}_0 \\ (\mathbf{\Omega}^{-1})^{*}\mathbf{f}_1^{*} \end{bmatrix}$ to yield a second output;

correlating the first output with a product of a complex conjugate of a long spreading code and a first extended walsh code to yield a third output;

correlating the first output with a product of the complex conjugate of the long spreading code and a second extended walsh code to yield a fourth output;

correlating the second output with the product of the complex conjugate of the long spreading code and the first extended walsh code to yield a fifth output;

correlating the second output with the product of the complex conjugate of the long spreading code and the second extended walsh code to yield a sixth output;

summing the third output and a complex conjugate of the sixth output to yield a first symbol estimate; and

subtracting a complex conjugate of the fourth output from the fifth output to yield a second symbol estimate.

23. The method of claim 22 further comprising:

correlating the first output with a product of the complex conjugate of the long spreading code and a first pilot walsh to yield a seventh output;

correlating the second output with a product of the complex conjugate of the long spreading code and a second pilot walsh to yield an eigth output;

summing the seventh output and complex conjugate of the eigth output to yield a ninth output;

subtracting 1 from the ninth output to yield an error measure.

24. (new): The method of claim 23 further comprising using the error measure to adapt an estimate of the upper and lower components of the receiver vector.

25. (new): The method of claim 23 further comprising:

computing a magnitude square of the error measure;

low pass filtering the magnitude square of the error measure;

computing an inverse of the filtered magnitude square of the error measure; and

providing the computed inverse to a soft decision decoder as a measure of reliability.

26. (new): In a linear mimimum mean-square error receiver, a method of providing optimal linear estimates of a plurality of symbol substreams comprising:

filtering a received signal with a time reverse of an upper component, $\mathbf{\Omega}^{-1}\mathbf{f}_0$, of a receiver vector, $\mathbf{v}_{MMSE\_s_0} = \frac{\mathbf{\Gamma}^{-1}}{NI_{or}} \propto \begin{bmatrix} \mathbf{\Omega}^{-1} & 0 \\ 0 & (\mathbf{\Omega}^{-1})^* \end{bmatrix} \begin{bmatrix} \mathbf{f}_0 \\ \mathbf{f}_1^* \end{bmatrix} = \begin{bmatrix} \mathbf{\Omega}^{-1}\mathbf{f}_0 \\ (\mathbf{\Omega}^{-1})^* \mathbf{f}_1^* \end{bmatrix}$ to produce a first output

filtering the received signal with a time reverse of a lower component, $(\mathbf{\Omega}^{-1})^* \mathbf{f}_1^*$, of the receiver vector, $\mathbf{v}_{MMSE\_s_0} = \frac{\mathbf{\Gamma}^{-1}}{NI_{or}} \propto \begin{bmatrix} \mathbf{\Omega}^{-1} & 0 \\ 0 & (\mathbf{\Omega}^{-1})^* \end{bmatrix} \begin{bmatrix} \mathbf{f}_0 \\ \mathbf{f}_1^* \end{bmatrix} = \begin{bmatrix} \mathbf{\Omega}^{-1}\mathbf{f}_0 \\ (\mathbf{\Omega}^{-1})^* \mathbf{f}_1^* \end{bmatrix}$ to produce a second output

correlating the first output with a product of a complex conjugate of a long spreading code and a walsh code to yield a first output sequence;

correlating the second output with the product of the complex conjugate of the long spreading code and the walsh code to yield a second output sequence;

summing a complex conjugate of a current output of the second output sequence with a previous output of the first output sequence to yield a first symbol estimate; and

subtracting a complex conjugate of a current output of the first output sequence from a previous output of the second output sequence to yield a second symbol estimate.

27. (new): The method of claim 26 further comprising:

correlating the first output with a product of the complex conjugate of the long spreading code and a first pilot walsh to yield a third output sequence;

correlating the second output with a product of the complex conjugate of the long spreading code and a second pilot walsh to yield a fourth output sequence;

summing the third output sequence and a complex conjugate of the fourth output sequence to yield a fifth output sequence; and

subtracting 1 from the fifth output sequence to yield an error measure.

28. (new): The method of claim 27 further comprising using the error measure to adapt an estimate of the upper and lower components of the receiver vector.

29. (new): The method of claim 27 further comprising:

computing a magnitude square of the error measure;

low pass filtering the magnitude square of the error measure;

computing an inverse of the filtered magnitude square of the error measure; and

providing the computed inverse to a soft decision decoder as a measure of reliability.